



NASA

Agenda for Tomorrow

SP-44-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-1229-1230-1231-1232-1233-1234-1235-1236-1237-1238-1239-1240-1241-1242-1243-1244-1245-1246-1247-1248-1249-1250-1251-1252-1253-1254-1255-1256-1257-1258-1259-1260-1261-1262-1263-1264-1265-1266-1267-1268-1269-1270-1271-1272-1273-1274-1275-1276-1277-1278-1279-1280-1281-1282-1283-1284-1285-1286-1287-1288-1289-1290-1291-1292-1293-1294-1295-1296-1297-1298-1299-1300-1301-1302-1303-1304-1305-1306-1307-1308-1309-1310-1311-1312-1313-1314-1315-1316-1317-1318-1319-1320-1321-1322-1323-1324-1325-1326-1327-1328-1329-1330-1331-1332-1333-1334-1335-1336-1337-1338-1339-1340-1341-1342-1343-1344-1345-1346-1347-1348-1349-1350-1351-1352-1353-1354-1355-1356-1357-1358-1359-1360-1361-1362-1363-1364-1365-1366-1367-1368-1369-1370-1371-1372-1373-1374-1375-1376-1377-1378-1379-1380-1381-1382-1383-1384-1385-1386-1387-1388-1389-1390-1391-1392-1393-1394-1395-1396-1397-1398-1399-1400-1401-1402-1403-1404-1405-1406-1407-1408-1409-1410-1411-1412-1413-1414-1415-1416-1417-1418-1419-1420-1421-1422-1423-1424-1425-1426-1427-1428-1429-1430-1431-1432-1433-1434-1435-1436-1437-1438-1439-1440-1441-1442-1443-1444-1445-1446-1447-1448-1449-1450-1451-1452-1453-1454-1455-1456-1457-1458-1459-1460-1461-1462-1463-1464-1465-1466-1467-1468-1469-1470-1471-1472-1473-1474-1475-1476-1477-1478-1479-1480-1481-1482-1483-1484-1485-1486-1487-1488-1489-1490-1491-1492-1493-1494-1495-1496-1497-1498-1499-1500-1501-1502-1503-1504-1505-1506-1507-1508-1509-1510-1511-1512-1513-1514-1515-1516-1517-1518-1519-1520-1521-1522-1523-1524-1525-1526-1527-1528-1529-1530-1531-1532-1533-1534-1535-1536-1537-1538-1539-1540-1541-1542-1543-1544-1545-1546-1547-1548-1549-1550-1551-1552-1553-1554-1555-1556-1557-1558-1559-1560-1561-1562-1563-1564-1565-1566-1567-1568-1569-1570-1571-1572-1573-1574-1575-1576-1577-1578-1579-1580-1581-1582-1583-1584-1585-1586-1587-1588-1589-1590-1591-1592-1593-1594-1595-1596-1597-1598-1599-1600-1601-1602-1603-1604-1605-1606-1607-1608-1609-1610-1611-1612-1613-1614-1615-1616-1617-1618-1619-1620-1621-1622-1623-1624-1625-1626-1627-1628-1629-1630-1631-1632-1633-1634-1635-1636-1637-1638-1639-1640-1641-1642-1643-1644-1645-1646-1647-1648-1649-1650-1651-1652-1653-1654-1655-1656-1657-1658-1659-1660-1661-1662-1663-1664-1665-1666-1667-1668-1669-1670-1671-1672-1673-1674-1675-1676-1677-1678-1679-1680-1681-1682-1683-1684-1685-1686-1687-1688-1689-1690-1691-1692-1693-1694-1695-1696-1697-1698-1699-1700-1701-1702-1703-1704-1705-1706-1707-1708-1709-1710-1711-1712-1713-1714-1715-1716-1717-1718-1719-1720-1721-1722-1723-1724-1725-1726-1727-1728-1729-1730-1731-1732-1733-1734-1735-1736-1737-1738-1739-1740-1741-1742-1743-1744-1745-1746-1747-1748-1749-1750-1751-1752-1753-1754-1755-1756-1757-1758-1759-1760-1761-1762-1763-1764-1765-1766-1767-1768-1769-1770-1771-1772-1773-1774-1775-1776-1777-1778-1779-1780-1781-1782-1783-1784-1785-1786-1787-1788-1789-1790-1791-1792-1793-1794-1795-1796-1797-1798-1799-1800-1801-1802-1803-1804-1805-1806-1807-1808-1809-1810-1811-1812-1813-1814-1815-1816-1817-1818-1819-1820-1821-1822-1823-1824-1825-1826-1827-1828-1829-1830-1831-1832-1833-1834-1835-1836-1837-1838-1839-1840-1841-1842-1843-1844-1845-1846-1847-1848-1849-1850-1851-1852-1853-1854-1855-1856-1857-1858-1859-1860-1861-1862-1863-1864-1865-1866-1867-1868-1869-1870-1871-1872-1873-1874-1875-1876-1877-1878-1879-1880-1881-1882-1883-1884-1885-1886-1887-1888-1889-1890-1891-1892-1893-1894-1895-1896-1897-1898-1899-1900-1901-1902-1903-1904-1905-1906-1907-1908-1909-1910-1911-1912-1913-1914-1915-1916-1917-1918-1919-1920-1921-1922-1923-1924-1925-1926-1927-1928-1929-1930-1931-1932-1933-1934-1935-1936-1937-1938-1939-1940-1941-1942-1943-1944-1945-1946-1947-1948-1949-1950-1951-1952-1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-2508-2509-2510-2511-2512-2513-2514-2515-2516-2517-2518-2519-2520-2521-2522-2523-2524-2525-2526-2527-2528-2529-2530-2531-2532-2533-2534-2535-2536-2537-2538-2539-2540-2541-2542-2543-2544-2545-2546-2547-2548-2549-2550-2551-2552-2553-2554-2555-2556-2557-2558-2559-2560-2561-2562-2563-2564-2565-2566-2567-2568-2569-2570-2571-2572-2573-2574-2575-2576-2577-2578-2579-2580-2581-2582-2583-2584-2585-2586-2587-2588-2589-2590-2591-2592-2593-2594-2595-2596-2597-2598-2599-2600-2601-2602-2603-2604-2605-2606-2607-2608-2609-2610-2611-2612-2613-2614-2615-2616-2617-2618-2619-2620-2621-2622-2623-2624-2625-2626-2627-2628-2629-2630-2631-2632-2633-2634-2635-2636-2637-2638-2639-2640-2641-2642-2643-2644-2645-2646-2647-2648-2649-2650-2651-2652-2653-2654-2655-2656-

Administrator's Message

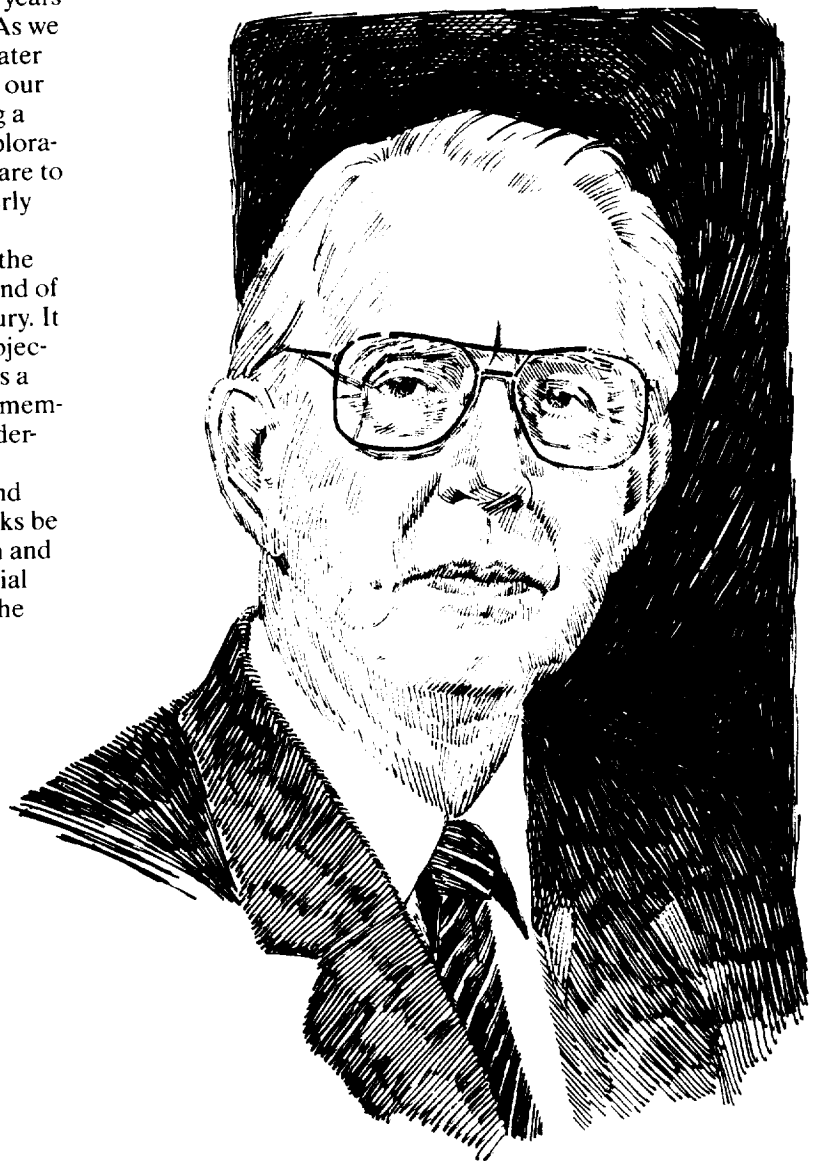
NASA has just entered its fourth decade. Guided by their mandate, the National Aeronautics and Space Act of 1958, the men and women of NASA have built an agency which is a precious national resource. NASA has made unique contributions to America's scientific and technological leadership, economic strength and competitiveness, pride at home, and prestige abroad.

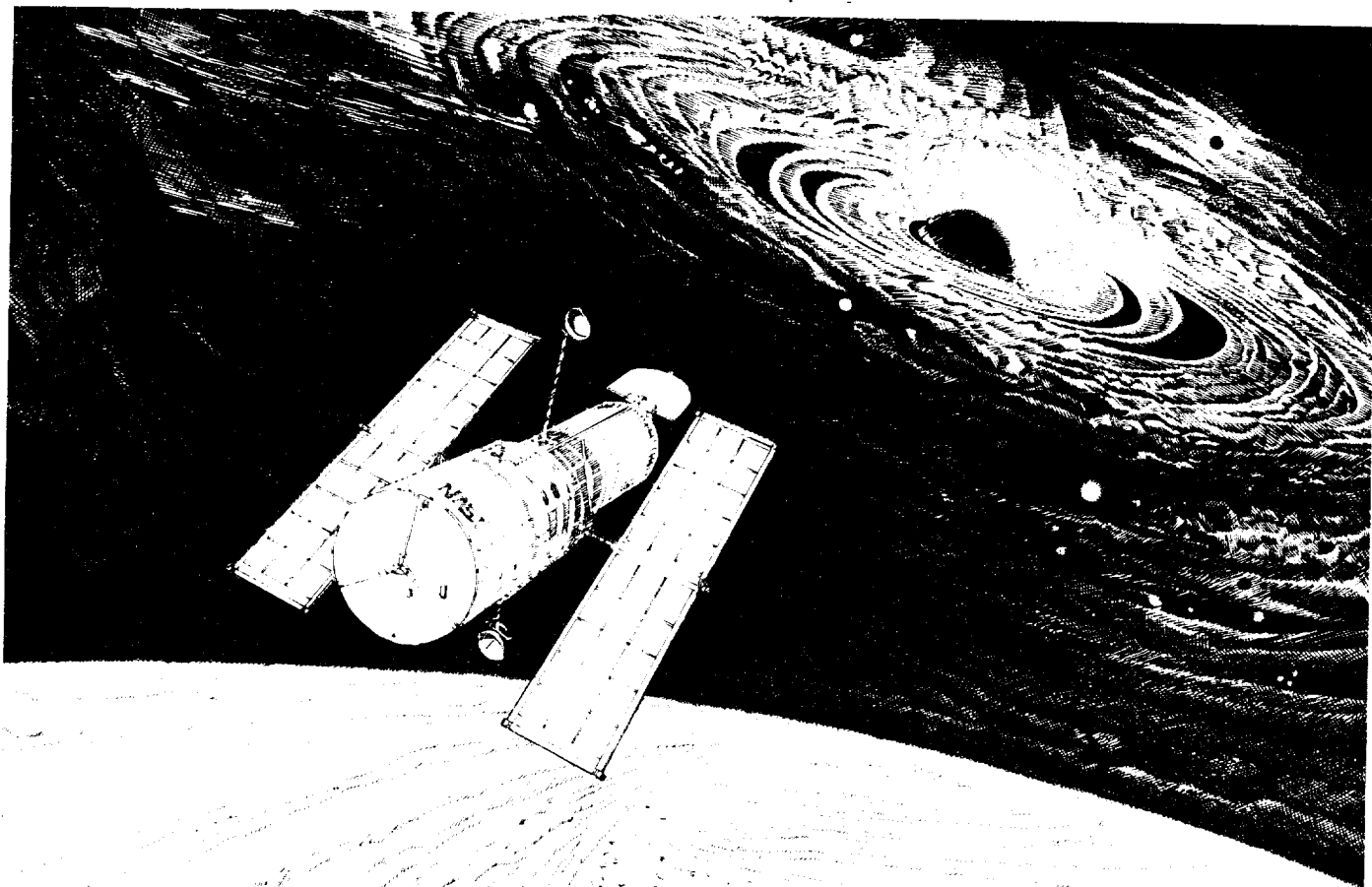
For three decades NASA's guiding principle has been, as it will be in the future, the expansion of human knowledge. With that principle at the core of its fundamental philosophy, NASA has redefined its goals through the years whenever necessary to meet the challenges at hand. As we prepare for the 21st century, those challenges are greater and more exciting than ever. They include increasing our understanding of Earth and the universe, establishing a permanent human presence in space, and human exploration of the solar system. If these ventures and others are to be successful, we must proceed, in a logical and orderly way, to chart our course.

This publication, *Agenda For Tomorrow*, outlines the essential framework for NASA's efforts through the end of this century and into the early years of the next century. It delineates clearly and concisely NASA's goals and objectives and the policies on which they rest. As such, it is a significant guidepost to the future. And I urge every member of the NASA team to read it to gain a greater understanding of NASA's purpose and direction.

Success in achieving our national goals in space and aeronautics will not come overnight. Nor will the tasks be easy. But with vision, skill, and continued dedication and commitment, NASA will continue to take the essential steps that will lead to even greater achievements in the years ahead.

James C. Fletcher
Dr. James C. Fletcher,
NASA Administrator
December 1988





NASA's Mission

NASA's mission is established by the National Aeronautics and Space Act of 1958, as amended. That mission is to advance science and technology in the disciplines appropriate to aeronautics and space activities; to develop applications of aerospace technology; to explore space; to develop and operate those systems necessary to furthering space science, technology, applications, and exploration; to seek cooperation with other nations and groups of nations in the peaceful application of space activities; and to develop the necessary human resources to support these efforts. NASA also provides aerospace research and development support to other agencies of the U.S. government as they discharge their respective responsibilities and seeks to encourage the fullest possible commercial use of space.

National Space Goals

The Presidential Directive on National Space Policy, released on February 11, 1988, states that a fundamental and continuing objective guiding United States space activities is space leadership. Leadership in an increasingly competitive international environment requires United States preeminence in key areas of space activity critical to achieving our national security, scientific, technical, economic, and foreign policy goals.

The overall goals of United States space activities are:

- To obtain scientific, technological, and economic benefits for the general population and improve the quality of life on Earth through space-related activities;
- As a long-range goal, to expand human presence and activity beyond Earth orbit into the solar system;
- To encourage continuing United States private-sector investment in space and space-related activities;
- To promote international cooperative activities taking into account United States national security, foreign policy, scientific, and economic interests;
- To cooperate with other nations in maintaining the freedom of space for all activities that enhance the security and welfare of humankind; and
- To strengthen the security of the United States.

National Aeronautical Research and Development Goals

Advances resulting from aeronautics research and technology development yield important national benefits that must be maximized by American enterprise. Toward this end, both government and industry must combine their efforts to achieve technological goals having potential for broad future application. Major U.S. goals in aeronautical

research and development, identified in the report, "National Aeronautical R&D Goals: Technology for America's Future," Office of Science and Technology Policy, March 1985, are as follows:

- Subsonics: To develop the technologies that will spawn a new generation of fuel-efficient, affordable aircraft.
- Supersonics: To develop the pacing technologies for sustained supersonic cruise capability.
- Transatmospherics: To develop the enabling technologies for routine cruise and maneuver capability in and out of the atmosphere using conventional runways for take-off and landing.

Key to the support and ultimate realization of these critical technology goals are the continued availability and productivity of the nation's unique aeronautical R&D facilities.

NASA Values and Principles

How NASA conducts itself in striving for mission success and in implementing national policy is a key determinant to its success. The values and principles that guide and govern NASA actions are as follows:

- *Pursuit of Excellence*—NASA is committed to excellence and quality in all endeavors, both technical and managerial. Excellence, which is the cornerstone of world leadership, manifests itself in mission success and in innovation, which will be aggressively pursued and encouraged.
- *Safety and Reliability*—NASA is fully committed to advancing the safety of its people and the reliability of its equipment even as it recognizes the inherent risks of its mission.
- *Respect for the Individual*—To foster a spirit of teamwork, NASA encourages an environment of mutual respect and open communications. NASA people are challenged in their work and recognized for their achievements, for the success of the Agency depends upon the success of its people.
- *Integrity*—NASA adheres to the highest levels of honesty and ethical standards, maintains consistency between its words and deeds, and is fully accountable for its actions.
- *Public Trust*—Because public funding is essential to success in accomplishing NASA's governmental mission, the American taxpayers are the ultimate "customer" of NASA. Through its people and programs, NASA is dedicated to adding value to the quality of American life and that of the entire world.

NASA Goals

To expand human knowledge of aeronautics and space into the 21st century, NASA will pursue the following major goals:

- Advance scientific knowledge of the planet Earth, the solar system, and the universe beyond.

- Expand human presence and activity beyond Earth orbit into the solar system.
- Enhance aeronautics research and technology development to strengthen U.S. leadership in civil and military aviation.

Successful pursuit of these major goals requires commitment to the following supporting goals:

- Operate an effective and efficient space transportation system and develop advanced space transportation capabilities.
- Establish the permanently occupied Space Station Freedom in low-Earth orbit during the 1990s for research, technology development, and operations.
- Expand space research and technology development to enable future civil mission options, to serve all national space sectors, and to promote civil space leadership.

As NASA pursues these goals, it will:

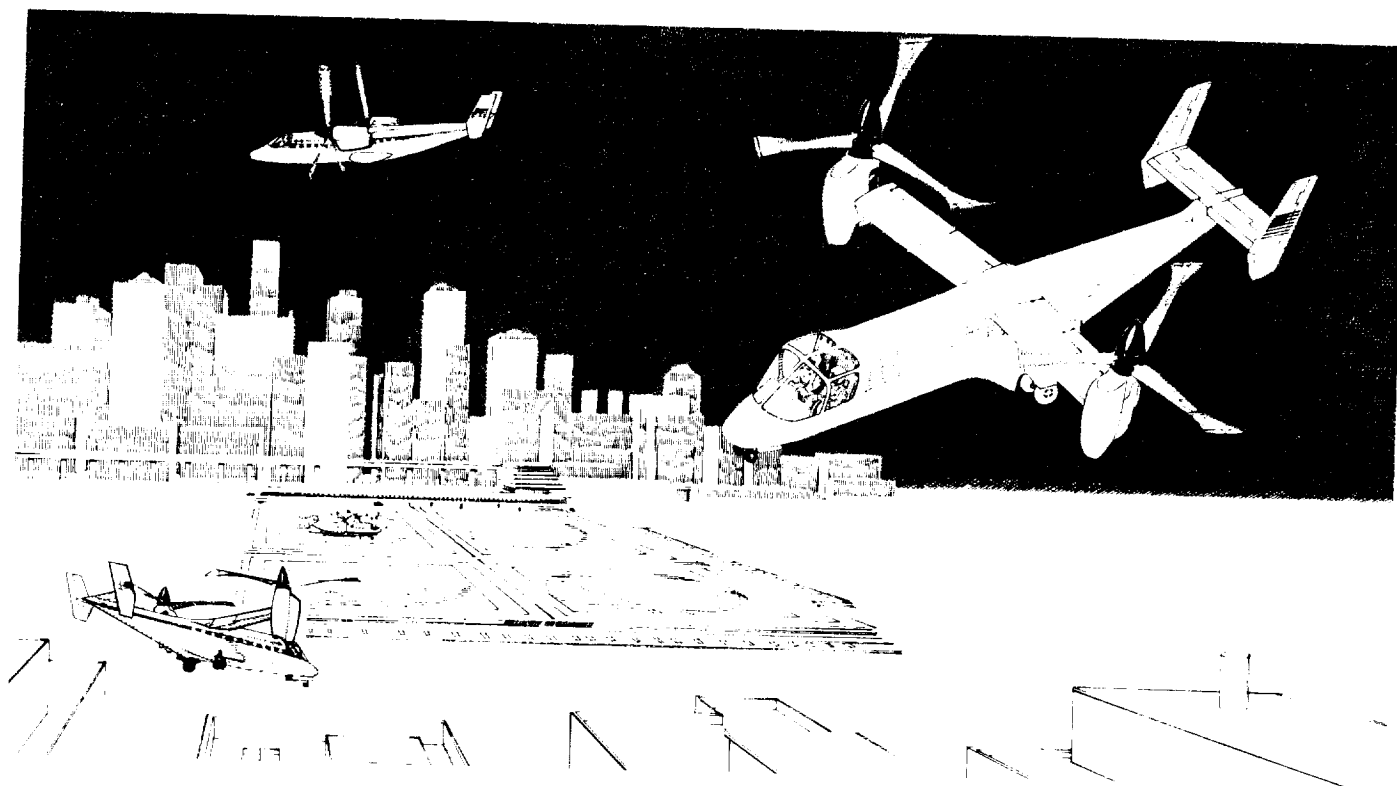
- Promote application of aerospace technologies to improve the quality of life on Earth and extend U.S. commercial enterprise beyond Earth.
- Conduct cooperative activities with other countries consistent with our national space goals.
- Develop and employ its human resources, physical facilities, and systems in space and on Earth for effective pursuit of NASA goals.

Major Objectives and Programs

The major objectives set by NASA and examples of the specific programs underway and planned that will achieve those objectives are summarized for the NASA goals in the following:

Advance Scientific Knowledge of the Planet Earth, the Solar System, and the Universe Beyond

- Complete the group of astronomical facilities known as the "Great Observatories" which will observe the universe across the electromagnetic spectrum with unprecedented resolution and sensitivity. *The facilities in development or planned are the Hubble Space Telescope, Gamma Ray Observatory, Advanced X-Ray Astrophysics Facility, and Space Infrared Telescope Facility.*
- Complete a detailed scientific characterization for virtually all of the solar system. *Programs of solar system exploration include Magellan to Venus, Galileo to Jupiter, Mars Observer, and the planned Comet Rendezvous-Asteroid Flyby, Cassini to Saturn and Titan, and Lunar Observer missions.*
- Quantitatively characterize the physical behavior of the Sun, the origins of solar variability, the geospace environment, and the effects of solar processes on Earth. *Ulysses and International Solar-Terrestrial Physics missions are in development and missions such as the Orbiting Solar Laboratory and Solar Probe are planned.*



- Develop and exploit the unique capabilities provided by the Space Station Freedom, Spacelab, prospective commercially developed space platforms, and other orbital and sub-orbital systems to conduct basic and applied physics, chemistry, and biology research in a microgravity environment. *Key Spacelab missions in development are the U.S. and International Microgravity Laboratories and the Space Life Sciences missions. Data acquired on life science Cosmos missions of the USSR and those from the proposed NASA Lifesat program will contribute to biological research.*
- Establish a set of observing platforms to acquire data to enable a better understanding of the Earth's environment as a global system and eventually to predict occurrence of long-term changes. *Current programs include satellite and aircraft observations, and observations from the Shuttle, such as the Shuttle Imaging Radar. Under development are the Upper Atmosphere Research Satellite and Topex/Poseidon Ocean Experiments. Planned for initiation shortly is the Earth Observing System on the Polar Platform of the Space Station Freedom.*

Expand Human Presence and Activity Beyond Earth Orbit into the Solar System

- Develop, through an extensive advanced study program, options for future initiatives in human exploration of the inner solar system to guide both technology development and detailed exploration program planning. *Studies of alternative exploration programs have been initiated.*
- Acquire the scientific and engineering data to support the planning of human exploration beyond near-Earth orbit. *These data will come from programs of solar system exploration noted in the preceding sections,*

supported by advanced technology development in sample acquisition, analysis, and preservation; surface power; optical communications; and planetary rover technology.

- Enhance life sciences knowledge and technology to enable humans to explore and work safely in space for long durations. *Current programs include the Controlled Ecological Life Support System, Spacelab and Space Station Freedom Life Science missions, analysis of USSR data, and research (both on the ground and in space) into human performance under simulated conditions of long-duration space flight such as stress, confinement, and exposure to the space environment.*

Enhance Aeronautics Research and Technology Development to Strengthen U.S. Leadership in Civil and Military Aviation

- Build a technology base for ensuring world leadership in civil and military aeronautics by emphasizing emerging technologies, strengthening focused technology development in high pay-off areas, and ensuring the health and productivity of critical national facilities. *Key technologies receiving increased emphasis are advanced composite materials, advanced propulsion concepts, and aviation safety and automation. A major program is currently underway to revitalize the complement of NASA wind tunnels.*
- Extend technology development for aircraft and air-space advances to meet future needs in air transportation, including integration into the transportation system of new vehicle concepts such as tiltrotors and high-speed transports for higher productivity and throughput, highly automated aircraft systems for enhanced safety and capacity, and high-leverage technologies for superior U.S. aircraft for global markets.

The focus of current planning is on research and technology development for Subsonic Transport, Civil Tiltrotor/Commuter, and High Speed Civil Transport Aircraft.

- Develop the fundamental knowledge base and critical technologies to provide effective options for next generation military aircraft, including the capability for short take-off and vertical landing, unprecedented maneuverability and agility, and sustained supersonic cruise. *Plans for augmented programs in high-angle-of-attack and supermaneuverability, advanced short takeoff and vertical landing, and high speed technologies have been developed.*
- Demonstrate, by the mid-1990s, aerospace vehicle technologies for: horizontal takeoff from, and landing on, conventional runways; sustained hypersonic cruise and maneuver in the atmosphere; and acceleration to orbit and return. *A major element toward this objective is the National AeroSpace Plane program, conducted jointly with the United States Air Force.*

Operate an Effective and Efficient Space Transportation System and Develop Advanced Space Transportation Capabilities

- Operate the Space Shuttle and maintain safe, sustainable flight rates and capabilities that are compatible with payload requirements and program resources. *Following implementation of the recommendations of the Presidential Commission, the flight program has been reinitiated and capabilities are being upgraded to support the flight manifest of about 14 flights per year by 1994. The replacement orbiter is under construction for 1991 delivery, and development of the Advanced Solid Rocket Motor is planned to begin in the near future.*
- Establish and employ a Space Transportation System (STS) "mixed" fleet comprised of the Space Shuttle and expendable launch vehicles (ELVs). *Flight manifests for both Shuttle and ELV have been established. NASA's remaining inventory of ELVs will be employed for assigned missions until it has been depleted. Launch vehicle services offered by private sector operators will be selected competitively thereafter.*
- Assure availability of a variety of upper stages, carrier systems, and automated systems to provide simple, flexible, reliable transportation among STS, Space Station Freedom, and other payloads and systems in orbit and to support a permanent human presence in space. *Systems to be employed include the Spacelab, Orbital Maneuvering Vehicle, and Tethered Satellite System. The potential for ELV use to support space station operations is under study.*
- Enhance current space transportation capability/operations through advanced development and prepare for advanced missions by developing plans, concepts, and preliminary designs for advanced transportation systems to enable human and robotic exploration beyond Earth orbit into the Solar System. *Study, development, and eventually flight demonstrations will be employed for: next-generation launch systems either with new vehicles or through using elements of the*

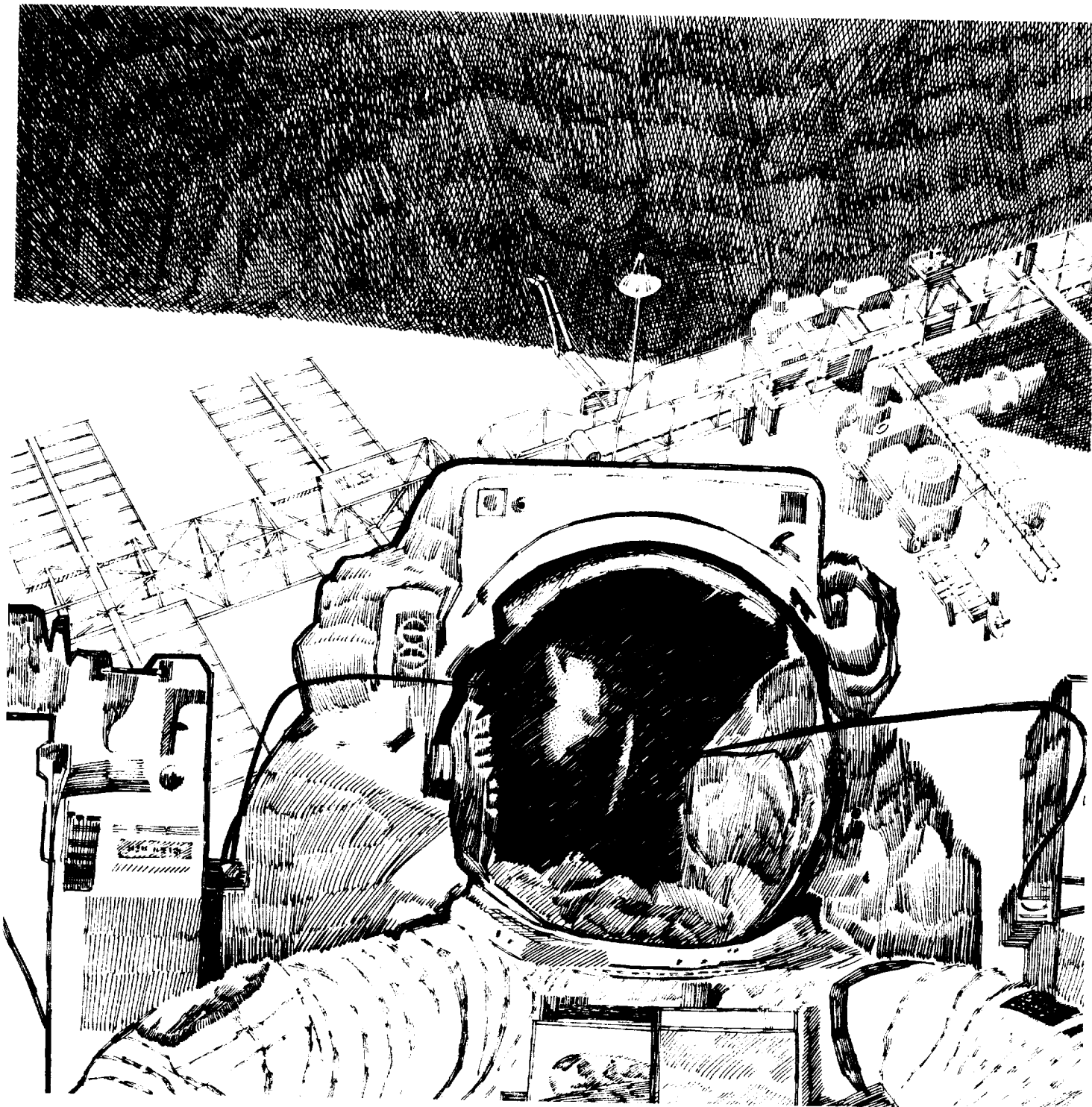
Space Shuttle (Shuttle C); orbit transfer and satellite servicing systems; assured crew return capability; and advanced operations support systems.

Establish the Permanently Occupied Space Station Freedom in Low-Earth Orbit During the 1990s for Research, Technology Development, and Operations

- Develop Space Station Freedom for permanent human occupancy during the 1990s. *Present plans call for:*
First element launch 1st Quarter 1995
Polar Platform launch 4th Quarter 1995
Human-tended capability 4th Quarter 1995
Permanently occupied 4th Quarter 1996
Assembly complete 1st Quarter 1998.
- Design and employ Freedom to enhance capabilities for space operations in science, applications, and technology development and to stimulate development of advanced technologies (e.g., automation and robotics).
- Provide growth capability to support future space endeavors including human presence and activity beyond Earth orbit.

Expand Space Research and Technology Development to Enable Future Civil Mission options, to Serve All National Space Sectors, and to Promote Civil Space Leadership

- Conduct a vigorous and productive research and technology base program in a continuing effort to serve the long-term needs of civilian and military users of space. *Programs are underway in a wide variety of disciplines, including aerothermodynamics, space energy conversion, propulsion, information sciences, and materials and structures.*
- Complete the Civil Space Technology Initiative to restore and enhance the Agency's technical strengths and to enable efficient, reliable access to and operations in Earth orbit and to support science missions. *This multi-year program focuses on research in propulsion, information systems, large structures and control, power, and automation and robotics.*
- Implement the Pathfinder program to develop the emerging, innovative technologies that will make possible both new and enhanced missions, including renewed exploration of the Moon, piloted missions to explore Mars, and the continuing automated exploration of the solar system. *Major Pathfinder thrusts include exploration, operations, and humans-in-space technologies.*
- Extend ground-based technology development and validation into space through a vigorous flight experiments program on the Shuttle, Expendable Launch Vehicles, and the Space Station Freedom. *A focused initiative, the In-Space Engineering Research and Technology program, is planned to make space accessible to industry and universities, as well as to NASA, for technology development.*
- Broaden university involvement in space engineering and stimulate technology innovations through expansion of the University Space Engineering Research Program. *Nine university research centers were estab-*



lished in 1988 and the program is planned to expand to 20 centers in the future.

- Enable and enhance deep space and near-Earth science, exploration, and space applications programs through developments in telecommunications, radio metrics, radio science, navigation, and real-time signal and data processing. Plans include employing a 34-meter diameter K-band antenna for deep-space missions and millimeter waves and optics for telecommunications; using the Global Positioning System to track Earth-orbiting missions with decimeter pre-

cision; and developing techniques to measure angular directions of deep-space missions with increased accuracy.

Promote Application of Aerospace Technologies to Improve the Quality of Life on Earth and to Extend U.S. Commercial Enterprise Beyond Earth

- Develop and apply advances in communications and information systems technology to meet future needs of NASA, other government agencies, the satellite communications industry, and the general public. The



Satellite-Aided Search and Rescue program is operational and is credited with contributing to saving over 1000 lives. The Advanced Communications Technology Satellite, under development, will demonstrate new technologies that will provide for high data rate communications to dispersed small terminals. Optical communications and communications to mobile systems are currently under study.

- Provide operational users of remotely sensed data with access to advances in remote-sensing technologies for improved services; foster utilization of those technol-

ogies for national economic benefit; and stimulate their broader utilization by the private sector. Conduct joint research efforts between government and the U.S. private sector to provide observing and information systems that employ the technologies to address important near-term environmental problems. The current program includes development of remote sensors to provide data of operational utility and a data and information system essential for use by operationally focused federal agencies and the private sector. It may be possible to transfer the National Oceanic and Atmospheric Administration's polar-orbiting meteorological payload to the planned Earth Observing System polar platforms to enhance the integration of research and operational activities.

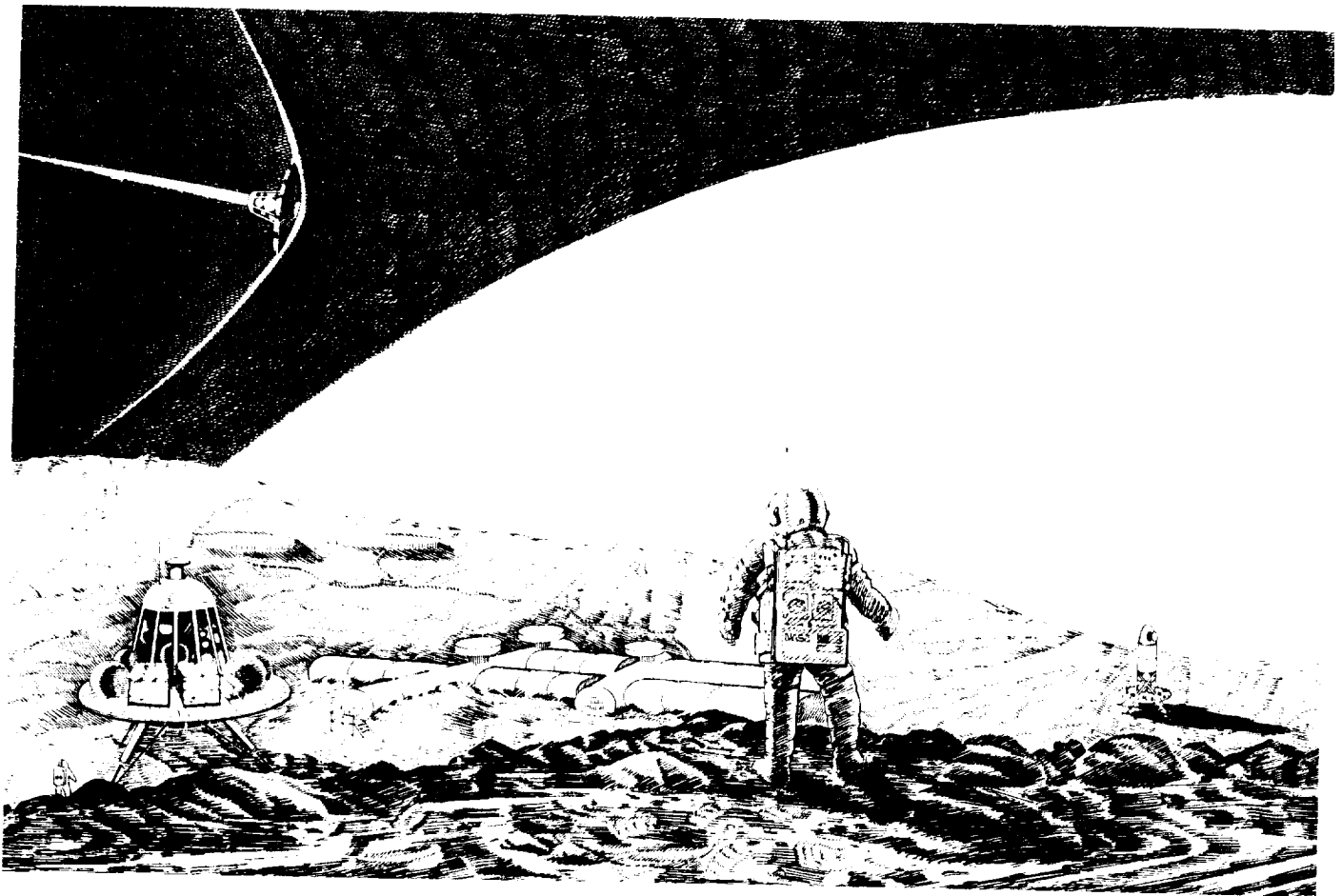
- Expand U.S. private sector investment and involvement in civil space activities. Commercial provision of launch vehicle services has begun. Agreements exist for a commercially supplied Transfer Orbit Stage, for two commercially developed and operated microgravity facilities (Industrial Space Facility and Spacehab), and for launch of commercially developed payloads. Additional commercial endeavors in planning include the use in orbit of expended Space Shuttle External Tanks and logistics resupply for Space Station Freedom. The private sector is heavily involved in the Centers for the Commercial Development of Space.

Conduct Cooperative Activities with Other Countries Consistent with our National Space Goals

- A principal cooperative activity is the participation of other nations as partners in the Space Station Freedom program. Recently the European Space Agency, Japan, and Canada signed agreements with the United States covering their participation.
- NASA cooperative programs with our friends and allies extend across the full range of space science and applications disciplines, and involve partners in every geographic region, including programs to investigate the dynamic processes in and on the Earth itself, the mechanisms which drive our atmosphere and climate, the transport of energy and matter in near-Earth space, the origin of the solar system, and the processes of the stars beyond.
- Under a 1987 agreement and enhancements agreed at the 1988 Moscow Summit, NASA and the USSR are cooperating in space sciences including solar system exploration, astronomy and astrophysics, solar terrestrial physics, life sciences, and Earth sciences. Activities range from exchange of medical data from long-duration human spaceflight missions to provision of flight opportunities for scientific instruments on each other's spacecraft and exchange of results of national studies of future automated solar system exploration missions, with an eye to assessing the possibilities for cooperation on them.

Develop and employ its human resources, physical facilities, and systems in space and on Earth for effective pursuit of NASA goals.

- Strengthen the institutional structure, maintain a highly effective workforce, "world-class" facilities, "state-of-



the-art" equipment and systems, and an environment emphasizing excellence. *NASA has recently secured a significant increase in personnel, has proposed an alternative personnel system, has underway a major wind tunnel revitalization program, and plans a comparable program for other critical NASA facilities.*

- Strengthen NASA's Affirmative Action Employment program and continue outreach efforts to assure a highly competent workforce that is integrated with minorities, women, and individuals with disabilities. *All NASA elements are continuing to work toward achieving affirmative action objectives. Special attention is being directed to increasing the future supply of competent scientists and engineers from the ranks of minorities, women, and individuals with disabilities and enhancing NASA's ability to compete for them.*
- Provide a quality worklife for NASA personnel that includes a challenging career, equal opportunity, and open communications, and recognizes employees based on their contributions. *A new emphasis has been placed on the environment of the workplace, with special attention to employee involvement, recognition, and career development.*
- Maintain safety, reliability, high quality, and productivity as key elements of NASA activities. *In response to the June 1986 recommendations of the Presidential Commission on the Space Shuttle Challenger*

Accident, the responsibility for oversight of safety, reliability, maintainability, quality assurance, and productivity was centralized in NASA. That office is currently fully involved in planning and implementing the programs that contribute importantly to safety and reliability in NASA's aerospace missions.

- Develop, operate, and maintain space and ground networks for tracking and communications that respond to user needs and provide high quality user services in a timely fashion and at reasonable cost. *Launch of the fourth Tracking and Data Relay Satellite in the coming months will provide an operational Tracking and Data Relay Satellite System (TDRSS). A second TDRSS ground station is soon to be built to reduce the potential for a single-point failure of the system and to allow upgrading of the original station. Deep Space Network (DSN) capabilities have been extended to meet current requirements, including those of the USSR Phobos mission and the Voyager encounter of Neptune. Further DSN improvements are planned to meet requirements of missions of the 1990s, including Mars Observer, Magellan, and Galileo.*
- Assure necessary and sufficient network capacity for communications and data systems to support future space and aeronautics mission operations. *Studies of an Advanced Tracking and Data Acquisition System and an Orbiting Deep Space Relay Station are underway.*

This pamphlet, *Agenda for Tomorrow*, contains key elements of national policy, NASA goals and objectives, and other materials that comprise the framework for NASA planning. The contents are expressed as they existed through much of 1988; thus they describe the strategic context employed by NASA in planning both the FY 1989 program just underway and the proposed FY 1990 program.

NASA planning will continue to evolve in response to national policy requirements, a changing environment, and new opportunities. *Agenda for Tomorrow* provides a status report as of the time of its publication.



NASA

National
Aeronautics and
Space
Administration

